5. EQ and Filtering

Objectives

- Identify **filter parameters**
- Discuss **types of EQ and filter**
- Consider ways in **which EQ and filtering can be used creatively** in Music Technology

Skills Development

- Numeracy (interpreting data)

Key Words

EQ
Filter
Low Pass
High Pass
Attenuation
Boost
Parametric EQ
Graphic EQ
Resonance
Q
Bandwidth
Cut Off Frequency
Centre Frequency
Gain

5. EQ and Filtering

- **Equalisation** is the process by which different frequency ranges are increased or decreased in volume.
- EQ units are made up of lots of **filters**.
- A filter can also be used by itself, and removes all frequencies beyond a **cut off**.
- The filter's **slope** determines how abruptly this happens.

Filter Parameters

Cut Off Frequency	The cut off frequency is the point at which the filter begins to remove frequencies; it is precisely measured at the point where the amplitude has dropped by 3dB.
Centre Frequency	The centre frequency is the mid-point of a band pass filter. It is precisely measured at the point where the outer limits of the filter have reduced in volume by 3dB.
Q / Bandwidth	The width (or 'bandwidth') of a band pass filter; a high value means that the filter is very narrow.
Resonance	Characteristic narrow boost of the frequencies around the cut off, which makes the sound 'whistly' or if over-used, introduces self-oscillation.

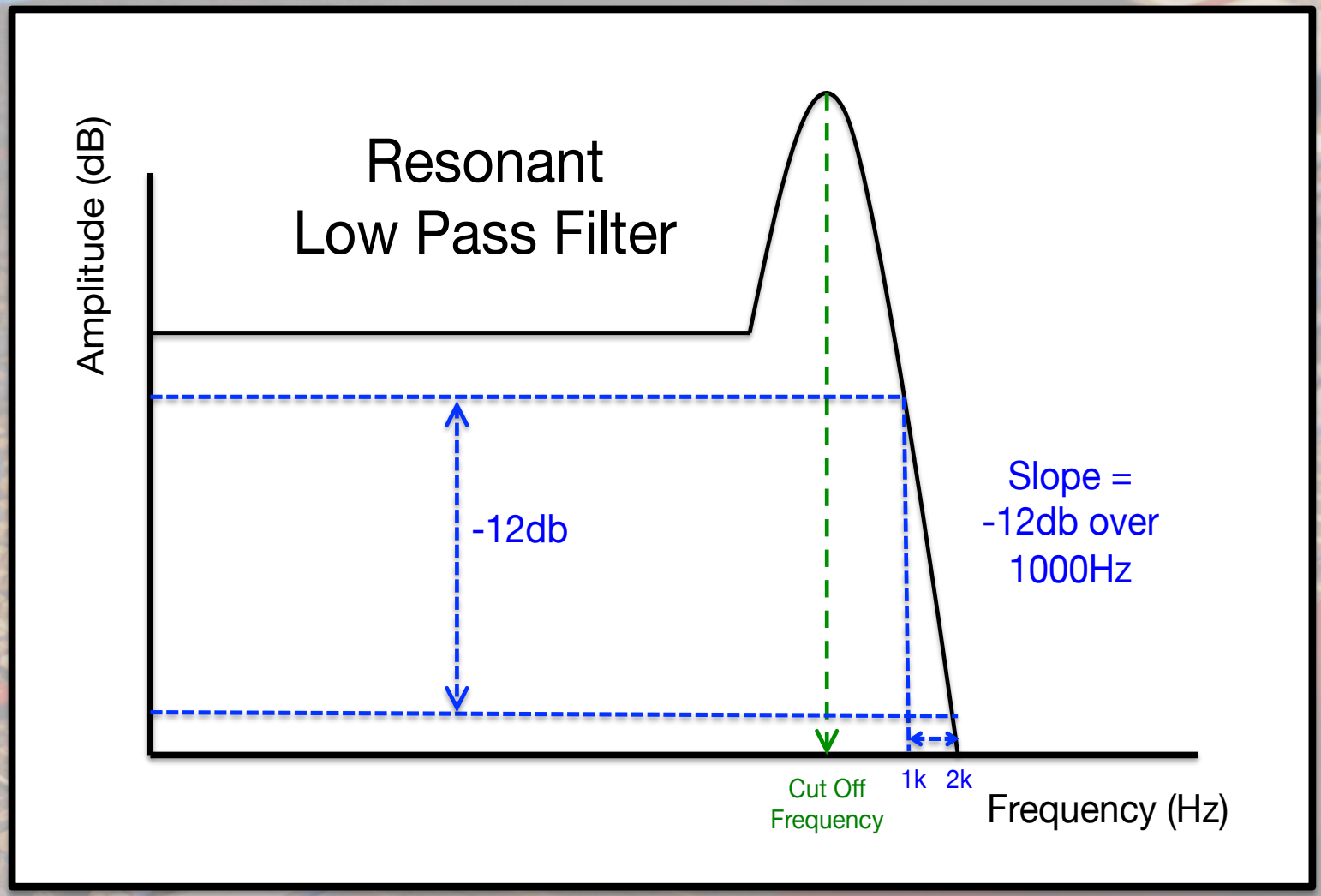
Low Pass Filters

- **Low Pass Filters** remove frequencies that are **above** a cut off frequency (i.e. allows the lows to pass)

- When the filter has a curve, the cut off frequency is often measured at the point when **3dB of amplitude reduction** has occurred.

- The cut off frequency in the diagram below is approximately **1000Hz.**

Low Pass Filters

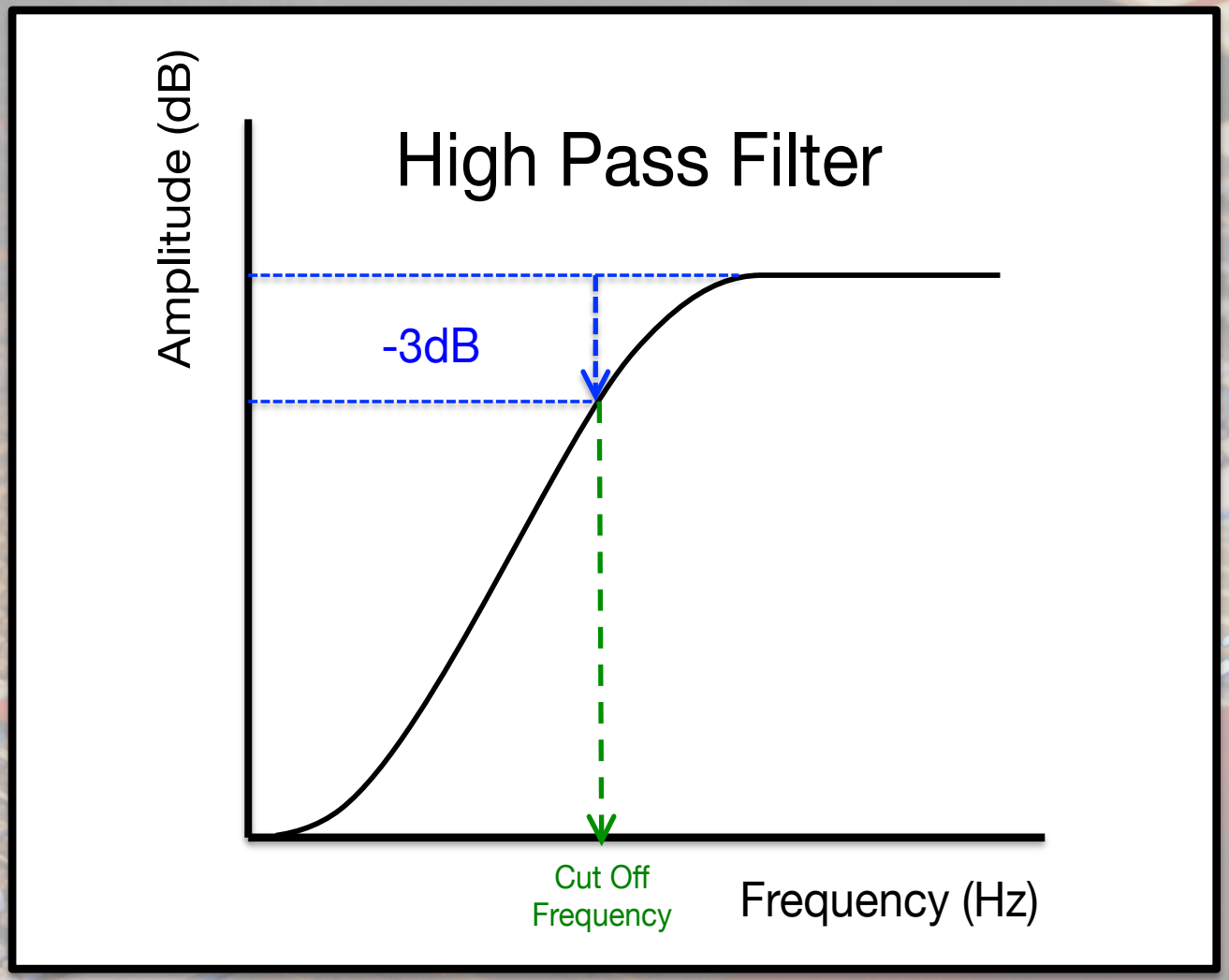


High Pass Filters

- **High Pass Filters** remove frequencies that are **below** a cut off frequency (i.e. allows the highs to pass)

- **They are often used as rumble filters** during recording to remove low frequency sounds that may have accidentally have been recorded.

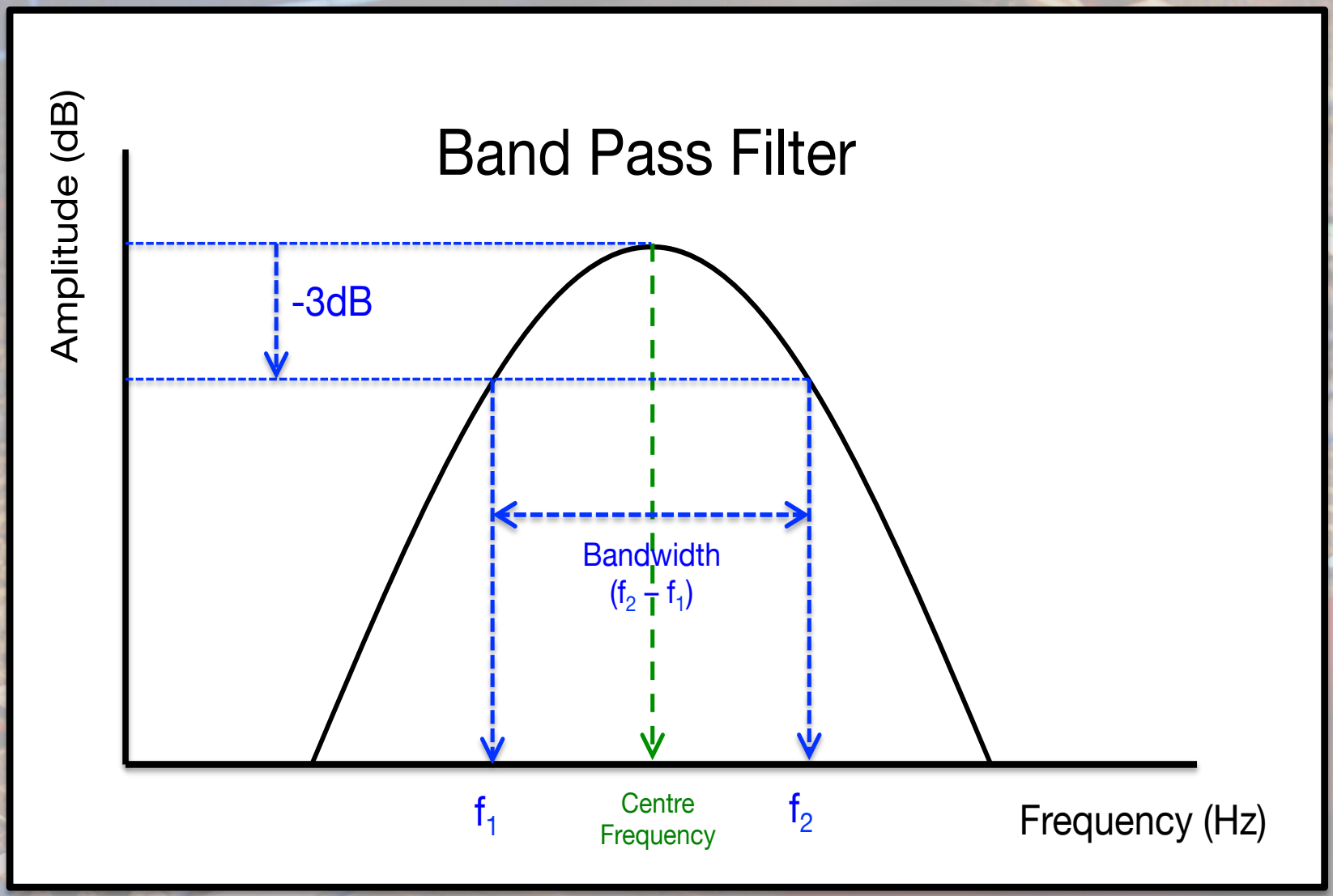
High Pass Filters



Band Pass Filters

- **Band pass** filters are a bell curve around a **centre frequency**.
- The width of the curve is defined by the **Q value**
- The frequencies can be cut or boosted
- Band pass filters can be used to create a **wah wah** effect, when the centre frequency is **swept** across the frequency spectrum.

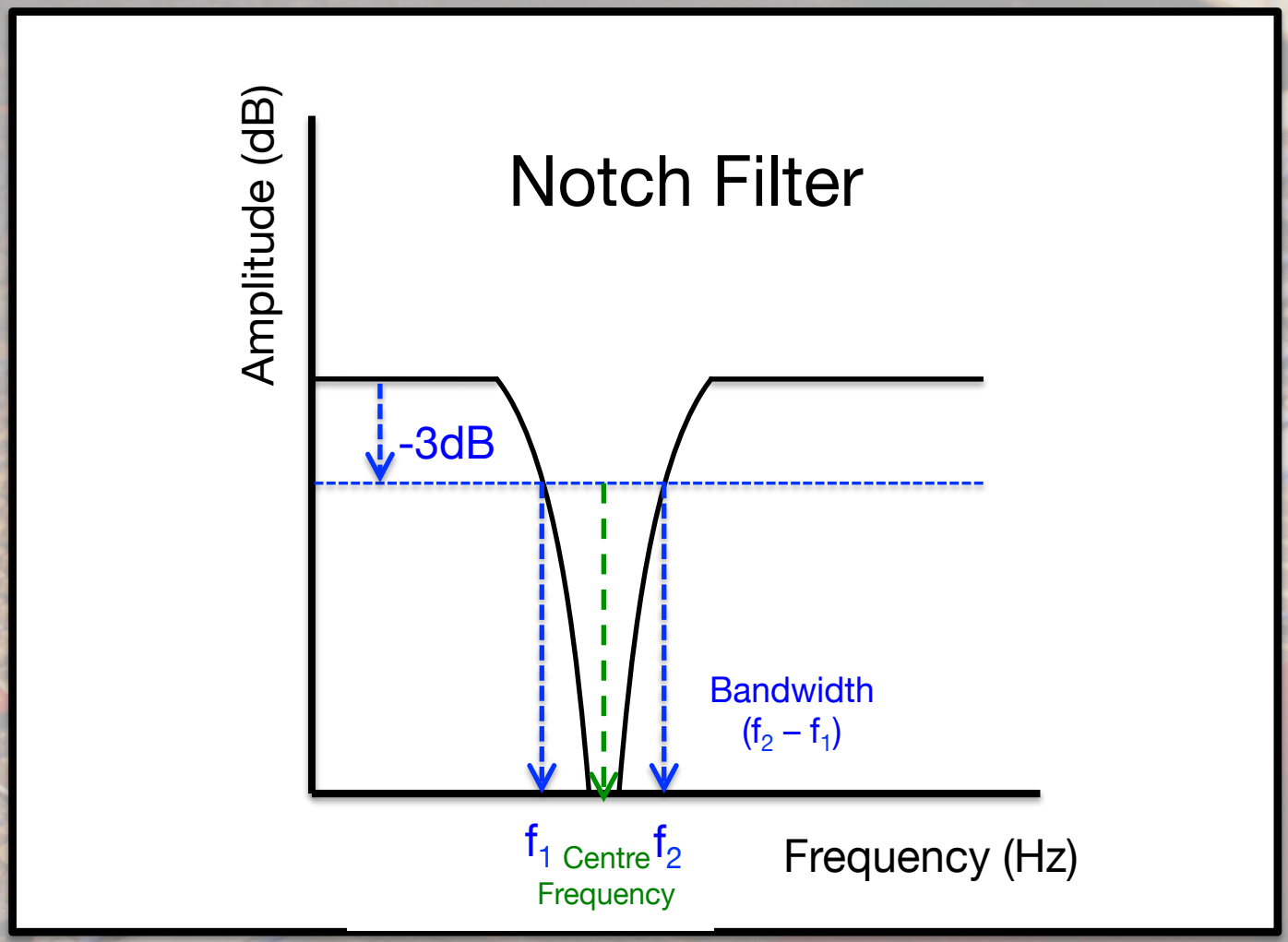
Band Pass Filters



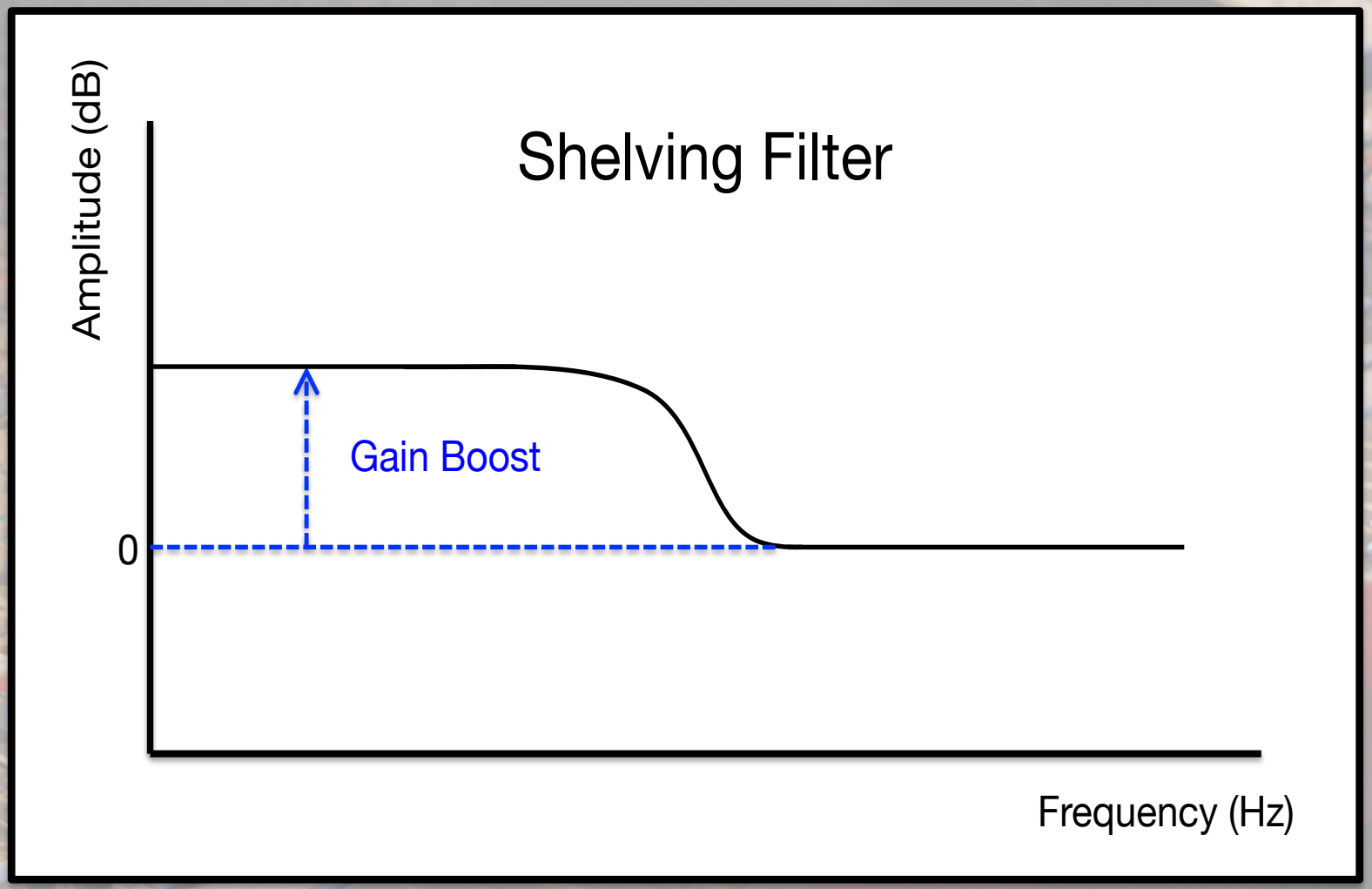
Other Filters

- A **notch filter** is a band pass filter with a **very high Q value** (narrow curve).
- It is used to remove a specific frequency, for example for feedback in live sound.
- A **shelving filter** boosts or cuts all of the frequencies beyond a certain point; this is applied evenly once the slope has been achieved.

Notch Filter



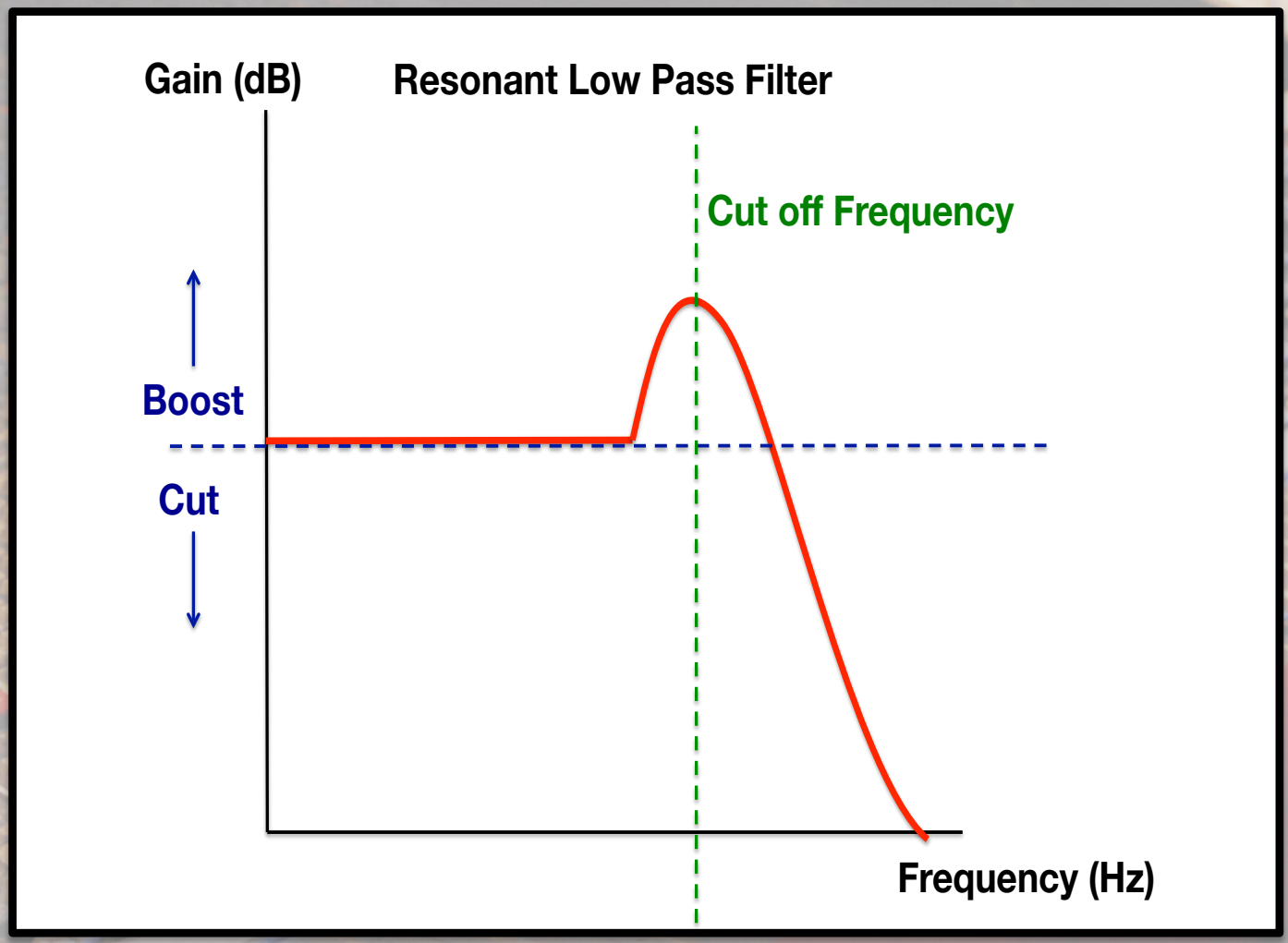
Shelving Filter



Resonance

- **Resonance** is when the frequencies **around the cut off frequency** are boosted.
- The **Q** defines how narrow or wide the boost is.
- Resonance sounds **‘whistly’**
- When over-used, it can introduce **self-oscillation**, which is where the filter sounds like it is creating a musical note.

Resonance


Gain (dB)
Resonant Low Pass Filter
Cut off Frequency
Boost
Cut
Frequency (Hz)

Filters in Dance Music

- Filters are often used in dance music to create a sense of **build or breakdown.**

- This is done by **automating the cut off frequency** of a **low pass** or a **high pass filter**

Parametric EQ

- **Parametric EQs** work using a number of different types of filter.
- Logic's **Channel EQ** is an example of a parametric EQ.
- Parametric EQs will show an **overall curve** which is created by combining all of the filters, and are often seen on DAWs, software and digital effects and processors

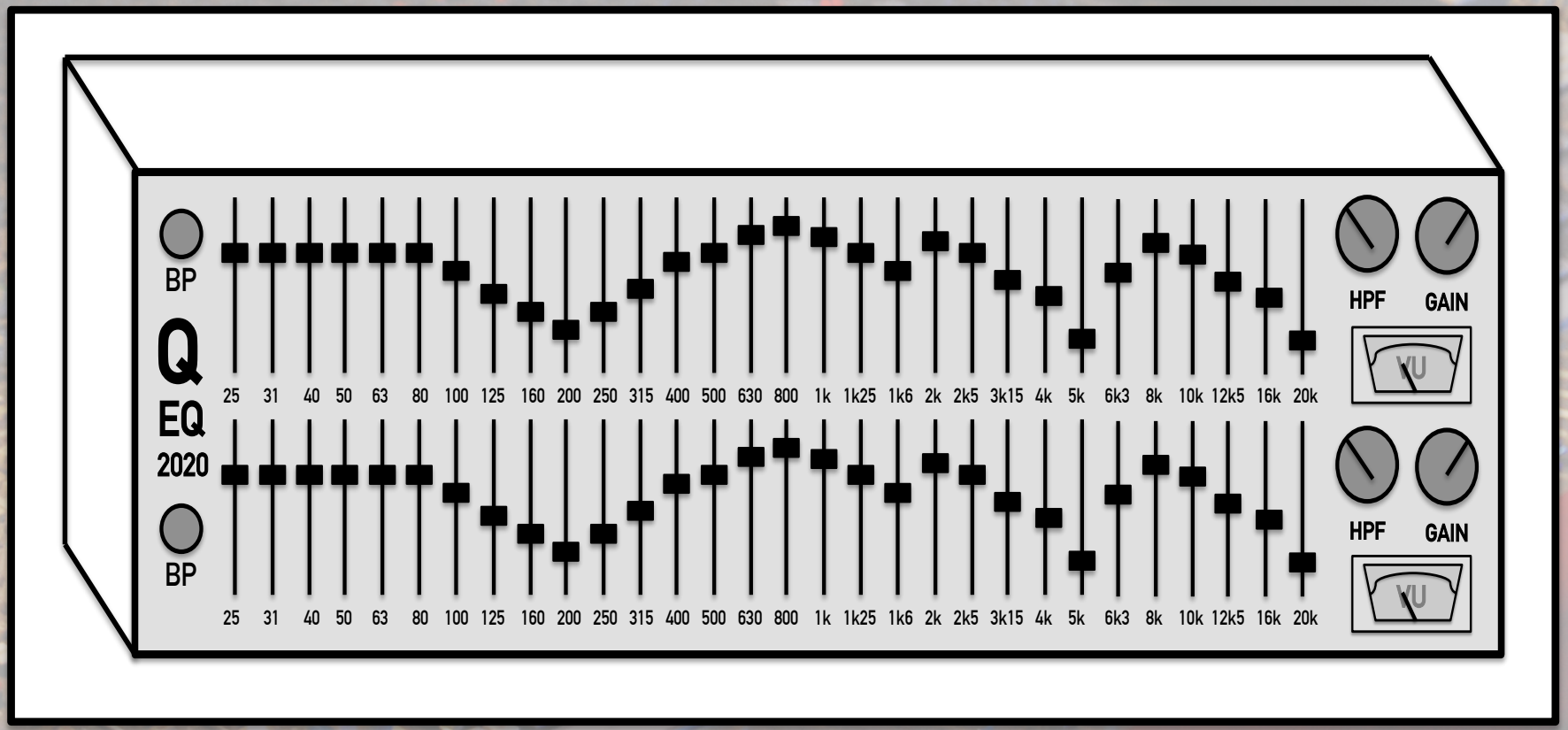
Parametric EQ

Graphic EQ

- **Graphic EQs** use a bank of filters which are used to individually boost or cut specific parts of the frequency spectrum.
- The labels on the EQ sliders are the **centre frequencies** of each filter
- The name comes from the fact you can see the **overall curve** when the sliders are moved
- Graphic EQs are **commonly used in live sound**

Graphic EQ

Graphic EQ to Label



Parametric EQ to Label